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AN EXPOSURE SHOWING POST-KANSAN GLACIATION NEAR IOWA CITY, IOWA

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While collecting field data pertaining to the Pleistocene history of Iowa River, in Johnson County, Iowa, the writer recently examined a railway cut which furnishes some striking evidence, additional to that already presented by the late Professor Calvin, that a post-Kansan ice-sheet, much younger than the Kansan, invaded this part of the state of Iowa. It was thought, while this paper was being prepared, that no previous study of this interesting cut had been made, but Professor Shimek states that he examined the exposure some years ago.

The exposure is in a cut made in 1905 by the Cedar Rapids & Iowa City Interurban Railway. It is located $\frac{1}{8}$ mile northwest of the upper Interurban bridge across Iowa River and about 15 miles by rail northwest of Iowa City. The railroad grade here runs through the south end of a divide projecting somewhat into Iowa River valley, the summit of the divide at the surface of the cut being about 30 feet above the valley flat. The physiographic setting is shown in Fig. 1. This is within the area mapped as Iowan drift by Calvin.[1]

The cut is about 250 yards long and attains a maximum depth of 20 feet. For about 120 yards, the east end is till, and for 100 yards at the west end the material is yellow fossiliferous loess. Between these are contorted folds and rolls of Buchanan gravel in peculiar relation to the Kansan till below and overlain by 2 to 8 feet of till. The arrangement of the materials is shown in Fig. 2.

The oldest material in the cut is Kansan till—blue at the bottom and grading up in places into a grayish to yellow color according to the degree of weathering. The blue is very clayey, contains small pebbles, many of which are greenstone, and breaks with polyhedral

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[1] Samuel Calvin, *Iowa Geological Survey*, VII, opposite p. 92.

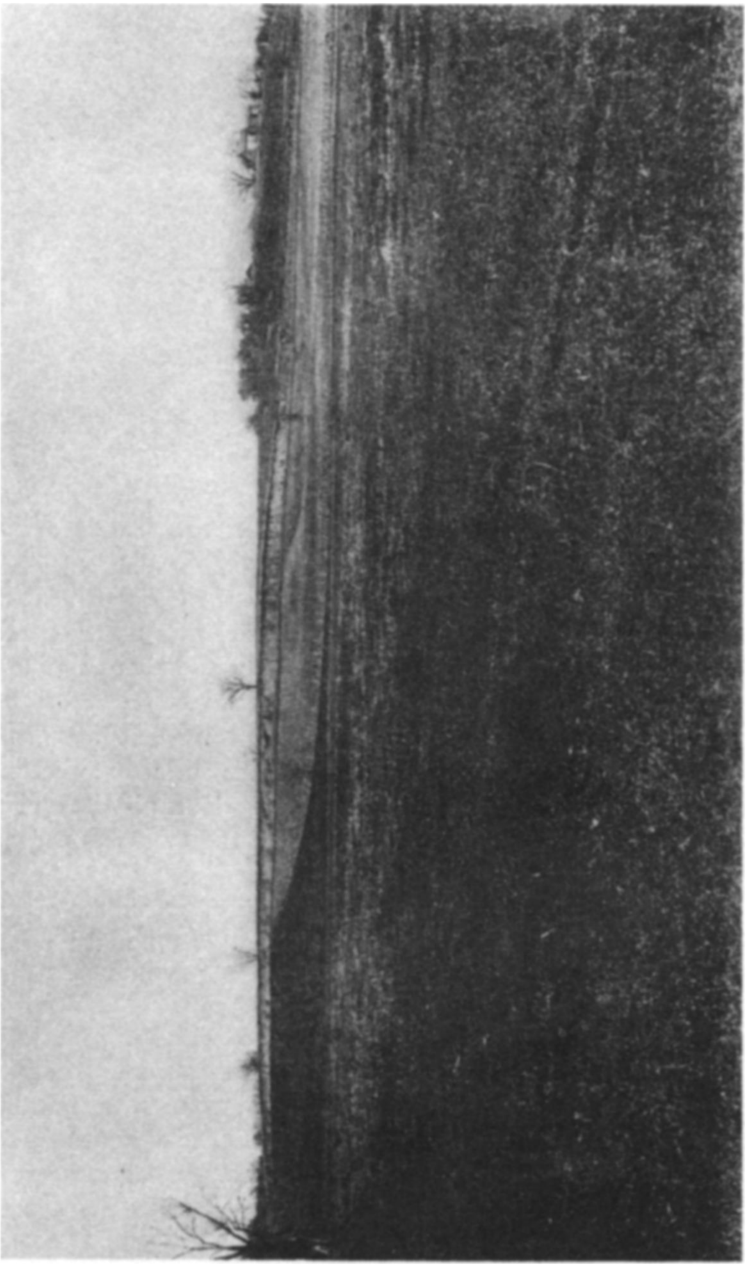

FIG. 1.—View looking north, showing the physiographic setting of the cut. The rolls can be faintly seen to the left of the east lone tree, on top of cut.

fracture. Joints are prevalent in the yellow clay and in the upper part of the blue, but instead of being vertical they dip toward the west, suggesting that they are the result of pressure from that direction. In that case they might be regarded as slight shear planes resulting from the same force that produced the distortion of the gravel above. Overlying this, in a peculiarly folded and contorted manner, is Buchanan gravel, the textural range of which is from fine flour to bowlders 1 foot in diameter. The gravel exhibits the usual oxidized, weathered, and decayed character. Ironstones are not uncommon and cementation by iron oxide is sufficiently prevalent to have preserved stratification lines at many points.

At the west end of this section (left end of Fig. 2), the gravel appears in a narrow band in the lower part and rises to the east at an angle of about 45 degrees, reaching a height of 16 feet. From this point the gravel follows a horizontal course eastward for about 75 feet and ends rather abruptly against till.

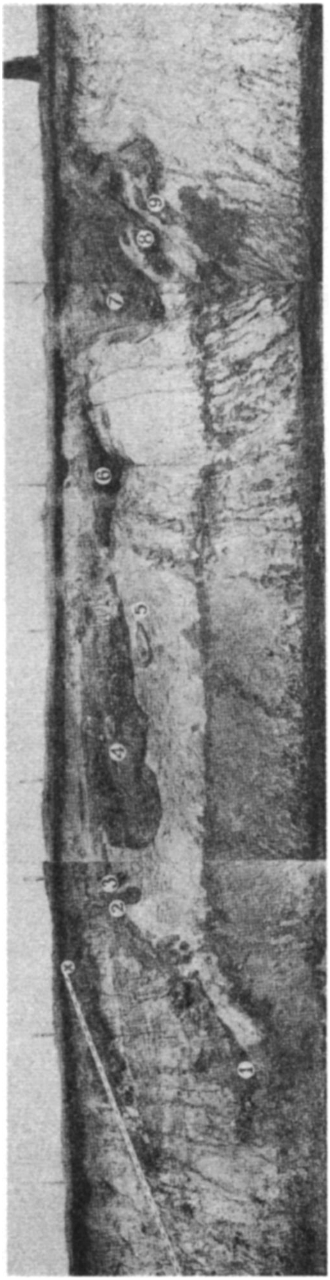

FIG. 2.—View of the north face of Interurban cut, 15 miles northwest of Iowa City, Iowa, showing the arrangement of Buchanan gravel on Kansan till and overlain by a later till. The numerical index is referred to in the text.

In this middle portion there is a peculiar series of contortions in the gravel. Reference to the photograph shows that (2) and (3) are two small, almost perfect, synclines of the closed type; (4) is a large, elongate body 27 feet long with an accumulation of small bowlders and gravel at the east end; (5) is a small elliptical roll having a nucleus of gravel with wrappings of till, all of which is surrounded by till; (6) marks a protruding compact body of gravel that has withstood slope-wash; (7) is a large downward loop 7 feet deep; and (8) and (9) appear as stringers projecting from the main body of the gravel into the till below.

At (1) and around the lower part of (7), the gravel, so altered that some cobbles can be picked to pieces by the fingers, rests against the blue unweathered till, and along the lower contact of (4) and around the lenticular body (5), the edge of a knife-blade can mark the separation of the oxidized gravel from the much less oxidized till. Till that is scarcely changed lies high in the arches between (7) and (8), and between (8) and (9). It is also striking that the gravel deep in the cut is as much weathered as that near the surface.

Overlying the gravel is a yellow, blue-streaked till, 2 to 4 feet thick across the summit, and attaining a thickness of at least 8 feet along the west monoclinal limb. On the western slope of this, beginning at the point (x) and lying in contact with the drift along a diagonal line (made clearer by dotting), lies yellow, fossiliferous loess which is not contorted but which shows deposition after the disturbance of the gravel. This body of loess is in the west end of the cut.

INTERPRETATION

To account for such folds, rolls, and contortions of Buchanan gravel into Kansan till in such a way as is revealed here, there can be but one possible interpretation. The sharp contact of the oxidized, altered, and rotten bowldery gravel upon unchanged till at points (1) and (7), and between (7) and (8), and between (8) and (9), and the sharp break below the elongate body (4) and around the lens (5) prove that the folding took place after the gravel was weathered. If the weathering had taken place since their disturbance, there should be at least a narrow gradation-zone between the weathered and the unweathered portions. Such, however, does not occur. Besides the foregoing significant relations, the gravel is uniformly weathered at different depths, but the till is not.

The conclusion is therefore clear that an ice-sheet, capable of distorting and molding this hill of material, invaded this region after the Buchanan gravel and some of the Kansan till were much weathered.

In view of the above interpretation there are four important points embodied in this cut: (1) the Kansan drift and the Buchanan gravel record the invasion and retreat of the Kansan ice; (2) the weathering of the same represents a considerable time interval after the Kansan invasion; (3) the contacts record the close of that interval and the folds give identity to the presence of a later ice-sheet and its movement; (4) the yellow loess, at least in this exposure, was deposited subsequent to the advance and retreat of the later ice-sheet.